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2. Ps. BANKSII Coues, ex *Pachyptila Banksii* Smith.—*Prion B.* Gld. *Procellaria B.* Schl. The fringe of serrations is apparent to the end of the bill. Chord of culmen 1.05; width of bill at widest point .50; height at base .44.

3. Ps. TURTUR Coues, ex *Proc. turtur* Banks "icon. ined. No. 15."—Also of Kuhl? *Prion turtur* Gld. The fringe of serrations is confined to the basal portion of the bill. Chord of culmen 1.00; height of bill at base .37; width .33.

4. Ps. ARIEL Coues, ex *Prion ariel* Gould.—? *Proc. turtur* Kuhl.—*Proc. ariel* Schl. *Halobæna typica* Bp.—? *Prion brevirostris* Gld. Smaller than *turtur*. Bill 9 to 10 lines, height  $2\frac{1}{2}$  lines; width  $3\frac{1}{2}$  to 4 lines.

Genus III. PRION Lacép. 1800—1. Serrations developed to the maximum. Lateral lamellæ hypertrophied, with inflated free edges. Culmen straight; lateral outline of bill convex to the unguis. A deep sulcus on either side of the culmen; another on the lower mandible for reception of the fringe. Inter-ramal space broad, nearly naked. Tail elongated, much graduated, contained  $1\frac{1}{2}$  times in the wing.

5. PR. VITTATUS Lacép. ex *Proc. vittata* Gm. *Pachyptila vitt.* Ill. *Proc. Forsteri* Lath. nec. Smith. *Pachypt. Forsteri* Swains. *Proc. latirostris* Bonn. Greatest width of bill three-fourths of an inch or more.

In a subsequent paper will be considered the *Diomedeinæ* and *Halodrominæ*.

#### Critical Review of the Family PROCELLARIIDÆ;—Part V; embracing the DIOMEDEINÆ and the HALODROMINÆ. With a General Supplement.

BY ELLIOTT COUES, M. D., U. S. A.

The group composed of the Albatrosses is so trenchantly distinguished from all other *Natatores*, that for its definite characterization it is only necessary to advert to the absence of the hallux, and to the position of the rhinothecæ. In other morphological points the Albatrosses conform closely to the type of structure which obtains throughout the *Procellariinæ*.

The Halodromes, if really components of the family *Procellariidæ*, are the most curiously aberrant of all the *Gaviæ* or Longipennine *Natatores*. They appear to hold a quite anomalous position, intermediate between several *natatorial* suborders. The very short falcate wings, no less than the absence of the hallux; the general configuration of the body, and especially the position of the posterior extremities relative to the axis of the body; as well as the compactly imbricated, glossy plumage; indicate a close affinity with the *Urinatores*, or Brachypterous *Natatores*. These structural resemblances are borne out by the attitudes, habits, and mode of life of the species, so far as we are acquainted with them; which are rather those of Guillemots than of Petrels. The dilation of the bill particularly of the under mandible, and the partially naked and distensible submental skin, which forms an imperfect pouch, point to a type of structure extensively prevailing among the *Totipalmi*. Most of the latter have the rhynchotheca segmented; so that almost the only character of the Halodromes which is strictly *Procellariidian* is the tubulation of the rhinotheca; and even in this feature the details of shape and direction of axis are entirely unique. So far indeed as external characters are concerned, arguments are adducible for their reference to either of the three tribes above alluded to; and especially to the *Urinatores*. It remains for the scalpel to finally determine their true affinities.

By Illiger\* the tubulation of the rhinotheca has been made indicative of a tribe (although called a family) *Tubinares*, which is attaching to it a value coördinate with such a character as *e. g.* the membranous union of the hallux

\* *Prodromus*, 1811, p. 274.

with the inner anterior digit, which defines what we now recognize as the tribe or rather suborder *Totipalmi*, embracing numerous families. Proceeding upon this basis we should be obliged in like manner to form a tribe or suborder "Linearinares" of what is now known as the family *Laridæ*, and erect its four recognized subfamilies into as many families.

By Bonaparte\* the order *Gaviæ* is made to consist of two tribes, the *Totipalmi* and the *Longipennæ*; the latter containing two families,—*Laridæ* and *Procellariidæ*—the differences between which essentially rest in the linear or tubular form of the nostrils; for continuity or division of the corneous rostral envelope does not always point to one or the other family, as the *Lestridinæ* of the *Laridæ* have somewhat the features of the *Procellariidæ* in this respect. In this arrangement an essentially brachypterous bird,—one truly a "diver" rather than a "flyer" in the sense in which these words are technically apposed—is classed among the Longipennines.

If a tubular rhinotheca be really the most essential feature, and at the same time of no more than family value, then its modifications may with propriety be held as indicative of three subfamilies *Diomedeinæ*, *Procellariinæ*, and *Halodrominæ*. But it is questionable whether such be indeed the case. An approach to this feature is seen in the *Lestridinæ*, (of a family otherwise exhibiting strictly linear basal nostrils, and an undivided rhynchotheca;) in which the so-called "cere" is really a segmentation of the corneous envelope and probably also indicative of tubulation of the nares. It is by no means proven that the peculiar nostrils of the *Procellariidæ* as generally defined, should not be held as subsidiary in importance to, or at least of no more than coördinate value with, other points of structure. Upon such an hypothesis the birds now called *Procellariidæ* would be divisible into three families, somewhat according to the following schedule:—

#### I. Tridactyle.

- A. Macropterous; "flyers;" the tubular nostrils disjoined,  
lateral, horizontal..... *Diomedeidæ*.  
B. Brachypterous; "divers;" the tubular nostrils united,  
culminal, vertical..... *Halodromidæ*.

#### II. Tetractyle.

- Macropterous; "flyers;" the tubular nostrils united, cul-  
minal, horizontal..... *Procellariidæ*.

But this arrangement is as faulty as the others, in the presence of an incongruous brachypterous element; and we should moreover be obliged to recognize a tribe or suborder for the three families thus collocated.

It will be evident, therefore, that so long as we regard a tubular rhinotheca as a primary fundamental character, not permitting of a wide separation of the forms in which it is present, we shall bring into juxtaposition certain types widely dissimilar from each other in most other respects; and that we do not obviate this difficulty when we make this character indicative of a suborder, under which several families may be ranged, any more than in considering it as of family importance, and forming our subfamilies upon its modifications. In either case we are met by the same objection. It remains to be proven that tubulation of the external nares is not a feature of subordinate importance to others, and as such, one which may coëxist in types otherwise presenting a widely diverse assemblage of characters. In which event, at least one genus now held as Procellariidian will be found to constitute a family of quite a different suborder; and certain others will form at least a family distinct from that of the Petrels proper. The test of anatomical investigation must be applied before the question can be definitely settled; for in one sense external characters of every sort are but the indices, as it were, of fundamental struc-

\* Schema Systematis Ornithologiæ, Compt. Rend. xxxvii. 1853.

tural modifications; and as such unavailable for the truly scientific definition of groups of a higher grade than families.

In calling attention to the foregoing considerations, I wish to be understood as offering no opinion upon the questions involved, and particularly as by no means asserting that the Halodromes are not true Procellariids. It is rarely of use to exchange one doubtful opinion for another; and for the present I shall follow the usually received classification. But it is safe to affirm that by the determination of the proper affinities of these birds the exact value of the character of tubulation of the rhinotheca is to be ascertained.

#### Subfamily *DIOMEDEINÆ*.

In a careful study of the Albatrosses, the interesting fact becomes evident, that we have an easy and convenient means of accurate diagnosis of species in the characters afforded us by the bill alone. All the known species differ from each other by perfectly tangible and readily appreciable variations in the size, shape and color of the bill; in the configuration of its several corneous elements, and in the outline of the feathers around its base. This latter feature, conjointly with the shape of the corneous covering of the culmen in that portion of its extent which is posterior to the nares, gives us such reliable data that we need hardly enquire further. I shall, therefore, in the following pages confine myself chiefly to detailed descriptions of the bill; and it will be noticed, as supporting the foregoing assertions, that a synoptical table may be drawn up solely upon the characters mentioned above.

As we shall study the bill somewhat in detail, I introduce, for convenience of description, several words expressive of the different corneous elements which cover it; the meaning of which will be obvious. I may remark that the piece interposed between the inferior mandibular rami at the lower border of their symphysis (here called the "interramicorn,") is a feature which also definitely characterizes this group, as it is present in no other. The presence of a well defined membranous fringe on the exterior toes is also highly characteristic.

In the following pages I describe eleven species—one of them supposed to be new—and indicate the possible existence of a twelfth. Of these one differs so much from the rest that it may be properly made the type of a genus distinct from *Diomedea*. The remaining species have also been subdivided into several genera, chiefly by Prof. Reichenbach. Such a collocation of species is certainly natural, regarded as simply expressive of the fact that certain of them are more intimately allied to each other, than they are to the species of another group; but the differences presented seem hardly sufficient to warrant our attaching generic import to them. The following will serve to explain the point alluded to.

Group A. Comprising *exulans*, *brachyura*, *nigripes*, *gibbosa*. Of largest and medium size. The bill is very broad, stout and heavy; and especially very wide at its base, and is uniform in color. The colors of the plumage are white, variegated with black, especially upon the wings; or uniform fuliginous. The tail is very short. The nostrils are large, and wide. *Exulans* may be considered as typical of this group. The length of tail reaches its minimum in *brachyura*, upon which character Prof. Reichenbach founds his genus *Phæbas-tria*.

Group B. Comprising *melanophrys*, *Gilliana*, n. sp. *cauta*, *culminata*, *chlororhyncha*, *olivaceirostris*. Of medium and rather small size. Bill shorter, weaker, and considerably compressed, usually bright or parti-colored. White, with black back and wings. Tail long, slightly rounded. *Melanophrys* may be taken as the type of this group, which constitutes the genus *Thalassarche* Reich. Both *melanophrys* and *Gilliana* differ from the other three species in the character of the culminicorn, as will be hereafter more particularly elucidated.

So varying are the characters of shape of bill, outline of frontal feathers, length of tail, etc., that I think they can hardly be made typical of distinct

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genera. *D. fuliginosa* itself would be hardly separable were it not for the presence of some features radically distinct from, and not merely a modification or varying combination of those presented by *Diomedea* proper.

#### DIOMEDEA Linnæus.

*Diomedea*, Linnæus, S. N. 1758, and of authors. Type *D. exulans*.

*Phæbastris*, Reichenbach, Syst. Av. Type *D. brachyura* Temm.

*Thalassarche*, Reichenbach, Syst. Av. Type *D. melanophrys* Boie.

Under this head I shall consider all the species of Albatross except *D. fuliginosa*. Its general characters have already been sufficiently elucidated. The points of difference between it and *Phæbætria* will be found in the synoptical table at the end of this article.

#### DIOMEDEA EXULANS Linnæus.

*Diomedea exulans*, Linn. S. N. i. 1766, p. 214; and of authors. Pl. Enlum. No. 237.—Vieill. Gal. pl. 295.—Gould, B. Aust. pl. 38, etc.

*Diomedea spadicea*, Gmel. S. N. i. pt. ii. 1788, p. 568.—Lath. Syn. v. 1785, p. 308, No. 2.—Lath. Ind. Orn. ii. 1790, p. 790.—Lath. Gen. Hist. 1824, x. p. 52, No. 2; (excl. Var. B.) Banks ic. ined. t. 25, fide Gray. *Young*.

*Diomedea albatrus*, Pallas, Zoog. Rosso-As. ii. 1811, p. . Forster, Desc. Anim. ed. Licht. 1844, p. 27.

? *Diomedea adusta*, Tschudi, Cab. Journ. f. Ornith. 1856, p. 157, sp. 7.

*Habitat*.—Southern Hemisphere at large; ranging to a considerable distance north in the Pacific.

The great size of this species renders it easy of recognition in any of its very diverse plumages. I will confine myself to a description of the bill, the general features of which may be taken as the standard of reference for all the species of the subfamily.

The frontal feathers form a rather obtuse angle on the forehead, whence they run forward on the side of the upper mandible to a point a little posterior to the root of the nostrils; whence, with a slight backward obliquity, they extend to the commissure. On the side of the lower mandible they come forward far beyond those on the upper, and have a very convex—almost angular—outline. This latter feature is constant, and of great value in distinguishing small *exulans* from large *brachyura* when both are in fuliginous plumage. (Compare outline as described under *brachyura*.) The point of greatest extension is nearly opposite the middle of the nostrils. The frontal feathers form a more reëntrant concavity on the forehead, and a more salient convexity on the side of the lower mandible, than in any other species except *fuliginosa*.

By gentle maceration in warm water, into which a little potassa or soda has been thrown, the various corneous elements of the bill readily separate from it and from each other, so that we can advantageously study them.

The "culminicorn" is transversely broad and rounded, but may be somewhat compressed or even a little carinated; a great difference in these respects being observable in a large series of bills. Its dorsal outline descends in a nearly straight line from the base to the middle of the bill; whence it more rapidly rises with much concavity to the base of the unguis. Its inferior border is curved with a convex border from its distal extremity to the nostrils; then a considerable concavity is formed by the cutting away of a space for the emergence of the nostrils. Behind these, it again dips down with a salient convexity to join the upper edge of the latericorn; their union, however, being rather a point than a line. The outline of the base corresponds with that of the frontal feathers above given; and there are usually found a few corrugations parallel with this outline. The distal extremity is more or less fused with the superior unguicorn or derthroeca, especially on the median line of the culmen.

The "latericorn" corresponds in its superficies with the shape of the mandible. 1866.]

bular ramus of the intermaxillary. Its superior border is nearly straight for its whole length; no emargination existing opposite the nostrils, nor hardly any decurvation in its terminal portion. A corneous ridge, incompletely fused with it, separates its true superior border from the inferior border of the culminicorn—occupying the length of the sulcus from the nostrils to its termination. Its inferior border is sharp and regularly curved in outline for its whole length. Internal to the commissural edge, it extends as an exceedingly delicate, thin lamina to line the roof of the mouth, fusing, anterior to the palatal fissure, with its fellow of the other side; more posteriorly distinct, and descending to cover the large swollen palatal bones, which latter make a prominent ridge on either side of the roof of the mouth towards its posterior part. The basal outline of the latericorn is that of the lateral frontal feathers, as above described. It terminates in an acute angle anteriorly.

The “unguicorn” or dertrotheca is large and strong, in size, shape and general appearance calling irresistibly to mind the claw of one of the large *Felidae*. It is much thicker, heavier and stouter than any other of the corneous elements. The convexity of its dorsal outline is great, being more than the quadrant of a circle. Its commissural edges are thin and sharp, very concave in outline: usually with an obsolete tooth, or, at least, a slight lobe.

The “naricorn” or rhinotheca is an irregularly convoluted little scroll, very thin, and delicate in texture. Its general shape is that of a turgid cone, whose apex presents backwards, and whose obliquely-truncated, irregularly-shaped base is anterior. This is simply inserted in the emargination of the under edge of the culminicorn, above described. A corneous parietes is wanting on the side which lies towards the median line of the bill; and, more anteriorly, there are numerous delicate convolutions, impossible to describe intelligibly. The general effect of these, however, is to produce a division into two parts of each nasal orifice, by a process which projects upwards and inwards. When the naricorns are *in situ*, the outer of these divisions, irregularly circular in shape, forms the most conspicuous part, and looks forward and a little upwards. The inner is much smaller, and hidden under a projecting ridge; and its aspect is quite lateral.

The “ramicorn” which covers the sides of the rami of the lower mandible is chiefly noticeable for the peculiar outline of its base, which, as already stated, formed the distinguishing feature of the under mandible of this species. It is deeply concave in outline; the superior cornu of the semilune running as an acute process, far upwards and backwards to the commissural termination. Terminally, the fusion with the inferior unguicorn is very incomplete. Its superior border runs downwards with a long concave sweep from base to tip; having posteriorly an obsolete groove for the reception of a ridge from the upper mandible. Inside the mouth, more anteriorly, the inner face of the ramicorn presents an elongated extensive ridge, whose superior aspect is concave, both longitudinally and transversely. This ridge rises higher and higher as it proceeds forward, till at its termination it is on a level with the commissural edge. The ridge in the bone itself is slight in size, compared with that produced by the folding over it of the heavy corneous covering.

The “inferior unguicorn” or myxotheca is subrectangular in its lateral aspect, the antero-superior angle being rounded off, and its posterior margin a little convex. Its tomial edges are sharp; and rise considerably above the edges of the bone they cover.

The “interramicorn” forms the gonal element of the bill. It is narrow, elongated and subcylindrical in shape; anteriorly completely fused with the myxotheca; posteriorly extending on the median line a considerable distance into the interrampal space, running to a fine point, and very gradually merging its corneous texture into that of ordinary dermal tissue.

The general shape of the bill appears sufficiently elucidated in the preceding descriptions of its several elements. The features whereby it is differentiated from that of any other species are these: Its great size, (chord of

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culmen 6.50 to 7.50;) its great breadth and strength; width and concavity of the culmen; huge, strong unguis; peculiar convolutions of the naricorn;\* the outline of the feathers, particularly on the side of the under mandible; and the uniform, very light yellowish color. These points will always separate from *brachyura* specimens of every variety of size and color.

The *D. spadicea* of Gmelin and Latham is now universally conceded to be based upon the young of this species. Latham's *spadicea* var. *B.*, however, I consider to be the young *brachyura*, for reasons stated elsewhere.

Mons. R. P. Lesson, holding that *spadicea* is distinct from *exulans*, commits the curious error of citing in support of his views a note sent him by Dr. Garnot, which refers to *Phæbetria fuliginosa*.†

*Diomedea adusta* Tsch. seems hardly different from this species, to which it is unhesitatingly referred by Dr. Schlegel.

#### DIOMEDEA BRACHYURA Temm.

*Diomedea spadicea*, var. *B.*, Lath. Gen. Hist. Birds, 1824, vol. x. p. 52, No. 2, var. *B.*; (cites Pl. Enl. 963).

*Diomedea brachyura*, Temminck, Pl. color. No. 554, adult. (cites Pl. Enlum. 963, as young.) Schlegel, Fn. Japon. pl. 66. (Young.) Gould B. Aust. vii. pl. 39, and of authors generally; excluding "*brachyura* juv." of Cassin and Lawrence, which is *nigripes* Audubon.

*Diomedea epomophora*, Lesson, Man. Orn. ii. 1828, p. 351.—Id. Traité d'Ornith., 1831, p. 609. Tschudi, Cab. Journ. f. Ornith., 1856, p. 156. Bp. C. A., 1855, ii. p. 185, [hand dubié.]

"*Diomedea chinensis*, Temminck."

*Habitat*.—Pacific Ocean at large. Abundant in the China Seas, and on the west coast of North America to a quite high latitude.

As is the case with other species, this one is readily diagnosticable by its bill alone. This is of the same fundamental character as that of *exulans*; but it is smaller, weaker, more compressed, with a vastly less concave culmen, less elevated, robust, and more attenuated and decurved unguis; and there is a very marked difference in the outline of the feathers around its base.

The frontal feathers embrace the bill in a nearly straight line as far as the lateral sulcus; forming almost no concavity on the culmen. Along the base of the latericorn, they run slightly obliquely backwards to the commissure. On the sides of the lower mandible they extend but slightly further than on the upper, having a scarcely convex outline.

The bill is stout, being especially wide at its base, which is large and heavy. Anterior to the nostrils, the culminicorn is compressed, and sometimes obsoletely carinated; posterior to them, it very rapidly flattens and widens, and extends so far downwards on either side that there is allowed no projection of the postero-superior corner of the latericorn. The latter, with the exception of this feature, and of a straighter commissural edge, is much as in *exulans*.

The dertrum is comparatively small: hardly rises above the level of the culmen; and is by no means so convex and hooked at the tip as in *exulans*. The myxa is longer, narrower and more attenuated.

The straightness of the commissure as compared with that of *exulans*; and the different outline of the feathers on the side of the lower mandible, are the main points wherein the outline of the ramicornus of the two species differ.

The nostrils are as in *exulans*, but smaller. The variations in plumage of

\* Existing, but to a less extent, in some other species.

† Lesson, Man., 1828, ii. p. 350.—"Cette espèce"—*spadicea*—"a été regardée comme le jeune âge du *exulans*; mais nous ne partageons pas cette opinion. A ce sujet nous imprimons textuellement une note, que nous a remise M. le Docteur Garnot. \* \* \* il s'exprime ainsi \* \* \* autour des yeux qui sont brun clair on voit un petit cercle de plumes blanches interrompu par une tache noir à l'angle interne de l'œil; le bec est noir; la mandibule inférieure présente sur ses faces deux lignes blanches membraneuses," etc., from which expressions it is palpable that a specimen of *fuliginosa* furnished the subject of the note.

this species are quite parallel with those of *exulans*, and need not detain us, as they are well known. A shining rusty yellow suffusion of the feathers of the head and neck is met with in perhaps the majority of adult specimens.

That this species is the *spudicea* var. B. of Latham, as above, when in the fuliginous state of plumage, is evidenced, if not by Latham's brief description, by his citation of Pl. Enl., No. 963, which gives correctly the outline of the frontal feathers and other points, whereby it is distinguishable from the young *exulans*. The same plate is also cited by Temminck himself as representing the young *brachyura*.

A specimen before me, unquestionably *brachyura*, is in precisely the state of plumage described under the name *epomophora* by Lesson in his works above cited, and recognized as a valid species by Tschudi and Bonaparte. The relative amount of black and white on the wings is very variable, the latter color sometimes pervading all the coverts; and at others being restricted to a small spot at the elbow, producing the appearance which suggested Lesson's name.

The questions arising from the confounding of *nigripes* Audubon with this species are discussed under head of the latter.

NOTE.—I find in the Smithsonian Institution a skull of an Albatross, wanting the lower jaw, in general features most like that of *brachyura*, (numerous examples of which are before me,) but differing as follows:—

It is considerably narrower and smaller in nearly all of its dimensions; the bill especially being slenderer, weaker and more compressed, with a less elevated and smaller unguis. The frontal outline is decidedly more concave on the median line. The culminicorn was narrower and less flattened basally; did not descend so low to meet the latericorn behind the nostrils, and was more convex along its dorsal outline. The frono-maxillary suture is narrower. The palatal bones are smaller and narrower, and sink to the level of the commissural edge much sooner.

A most marked difference is seen in the supra-orbital fossa for the lodgment of the gland, whose secretion is poured into the nasal cavity. It is very small, and particularly narrow; so that the least width between it and its fellow is greater than in *brachyura*, although the skull is narrower. These fossæ have no floors whatever on their anterior halves.

Numerous other minor differences may be summed up as resulting from the smallness and narrowness of the skull, which is well illustrated by the following measurements. It will be noted that the bill is absolutely longer, and therefore still more comparatively elongated than in *brachyura*.

Dimension.	<i>D. brachyura.</i>	<i>D. leptorhyncha.</i>
Fronto-maxillary suture to tip of bill.....	5.40	5.75
“ “ “ “ occiput.....	2.75	2.37
Greatest width of bill.....	1.37	1.08
“ “ “ skull (at post-orbital processes)	2.62	2.37
Width of fronto-maxillary suture.....	1.00	0.93
Length of supra orbital fossa .....	1.30	1.07

Upon these meagre, though decided data, I do not like to formally introduce a species; and must, therefore, for the present, content myself with pointing out the differences which exist in the specimen to which I have affixed the above name of *leptorhyncha*.

#### DIOMEDEA NIGRIPES Audubon.

*Diomedea nigripes*, Audubon, Orn. Biog. v. 1839, p. 327. Audubon, Birds Amer. vii. 1842, p. 198. [West coast Amer.] Cassin, Illust. B. Cal. & Texas, 1853, p. 210, pl. 35. [Cala.] Schlegel, Mon. Proc. Mus. Pays-

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Bas, 1863, p. 33. [China.] Swinhoe, Ibis, 1863, p. 431. [China Seas.]

*Diomedea brachyura* juv. Cassin, Illust. B. Cal. & Tex., 1853, p. 291. Lawrence, Baird's B. N. Amer., 1858, p. 822.

*Habitat*.—North Pacific. Coasts of Asia and America.

*Description*.\* Bill about a third longer than the head, slightly surpassing the tarsus, equal to the middle toe without its claw: comparatively stouter, and basally wider, than that of any other species (except *gibbosa*?). The culmen is perfectly straight to the middle of the bill; and has thence only a just appreciable concavity to the unguis; which latter is weak and small, scarcely rises above the level of the culmen proper, and is only moderately decurved and acute. The culminicorn is moderately wide, and subcarinated beyond the nostrils; posterior to them it is flatter and wider, spreading down so far on either side as to *overlap* the upper edge of the latericorn. Its comparative width is greater than in any other species. Although the basal outline is essentially rounded, as in *brachyura*, there is yet a slight angle formed on the median line, readily perceptible, which is not the case in *brachyura*. The great comparative width of the bill is produced chiefly by the turgid and protuberant latericorns, which give it an air of great thickness and solidity. The lateral sulcus is nearly straight from nostrils to unguis, and thence is only slightly decurved. The commissure is almost straight to the unguis. The outline of the inferior mandibular rami is quite straight to the inferior unguis, the point of which is somewhat elongated and decurved. The interramicorn is small and short, though quite convex in outline. The feathers on the side of the lower mandible extend further than on the upper; their outline has a gentle convexity. The nostrils are of moderate size; very short; rather obliquely placed, presenting upwards and forwards; and the emargination of the culminicorn, to allow of their protrusion, is very deep.

The tail is of moderate length, contained about three times in the wing from the carpal joint; is nearly square, the feathers having but a slight graduation, and all being broad to their very tips. (The tail of *brachyura* is contained about  $3\frac{1}{2}$  times in the wing.)

The tarsus is less than the middle toe without its claw, about equal to the inner without its claw; slender, moderately compressed. The outer toe is longer than the middle; the tips of the claws fall together. The tip of the inner claw about reaches the base of the middle one.

The plumage is dark chocolate brown; lighter and rather tending to plumbeous gray on the under parts generally. Some of the dorsal feathers, and most of the wing-coverts, have light grayish brown edges, as if faded; and a few feathers on the elbow are whitish except terminally. The region all around the bill is hoary white for a limited space; and then shades rapidly into the prevailing color of the head. A streak over and behind the eye and a spot just in front of it are nearly pure black. The primary quills are black, with a plumbeous cast on their inner vanes; their shafts bright yellow to near the tips. The tail is brownish black; paler below; the shafts dull whitish except apically. The long upper tail coverts which reach within one and a half inches of the end of the tail, are lighter brown than the rest of the upper parts, having sometimes a slight rufous tint. The feet and webs are black. The bill in the dry state is dark brown, almost black on the nail; its basal portions with a hoary glaucescence, its median portions tinged with reddish brown.

Chord of culmen 4.00, its curve 4.60, from feathers on side of upper mandible to its tip 3.50; ditto lower mandible 3.20; height of bill at base 1.50; greatest width 1.25. Tarsus 3.70; middle toe and claw 4.50, outer do. 4.50; inner do. 4.00. Wing 19 to 20. Tail about 6.50.

The preceding paragraphs are descriptive of a most excellent species of Al-

\* Taken from several typical examples from the coast of California in Mus. Smiths.

batross, very abundant in the North Pacific. It is readily distinguishable from the young *brachyura*, to which it assimilates so closely in its plumage, by its bill, which Dr. Schlegel has happily described as "très court, quoique gros." The shortness of the bill; its great width, especially basally where the culmicorn is so broad and descends so low as to overlap the latericorn; the general straightness of its several outlines, and its color; the relative proportions of the wings and tail; and the proportions and color of the feet, all furnish data ample for its separation from *brachyura*. So far as now known, the fuliginous plumage above described is its only one; but should it ever assume a livery like that of *brachyura*, still the above points of form will readily characterize it. The only question then is as to the name to be employed for it. American writers have without exception identified the "*nigripes*" of Audubon with the young *brachyura*.

Unfortunately I cannot find the type specimen of *nigripes* among the many types of other species of Mr. Audubon now in the Smithsonian Museum. I have before me the types of his "*chlororhynchos*" and "*fusca*;" but "*nigripes*" has been mislaid. We have therefore only his description as a guide; from which we must determine whether he had in view the present species or a young *brachyura*, also found on the Pacific coast of North America. In the latter event *nigripes* would become a synonym, and a new name be required for the species now under consideration.

Examining the dimensions given by Audubon we find several discrepancies. In general they may be stated as too large. The bill is by no means "five" inches long,—especially along the edge of the under mandible. The tail is six or more instead of "three" inches. The dimension given for the inner toe ( $1\frac{9}{12}$ ) is doubtless a typographical error. By carefully measuring Audubon's specimen of "*chlororhynchos*," I find that he took the *curve* of the culmen, not its chord. Applying this test to the specimens before me they measure 4.50 to 4.75 inches; which is sufficiently near the dimensions he states. But five inches along the edge of the under mandible is too great, even for the majority of adult *brachyura*; while three inches as the length of tail, is wide of the mark for either species. Eliminating palpable errors however, there is nothing in his description or measurements absolutely incompatible with the present species, though much confirming a suspicion that he may really have had a young *brachyura* in view; and I therefore think it best, at least until his type can be found, to accept his name, now well established, for this species, especially as the necessity for a new one will thereby be obviated.

#### DIOMEDEA GIBBOSA Gould.

*D. gibbosa*, Gould, Ann. Mag. N. H. 1844, xiii. p. 361. Id. Introd. B. Aust. 1848, p. 115.

*Habit.*—"North Pacific."

Of this species, which is autoptically unknown to me, Mr. Gould says: "It differs from every other that has come under my notice in the peculiar swollen and raised form of the upper mandible, which moreover rises high up on the forehead;" and further describes it as having the "face, ear coverts, chin, abdomen, upper and under tail-coverts white; the remainder of the plumage very dark brown approaching on the occiput, back of the neck, and wings, to black; bill yellowish horn color, becoming darker at the tip and at the base; feet in the specimen dark brown, but doubtless of a bluish gray, inclining to flesh color, in the living bird. Total length 30 inches; bill 4; wing 21; tail 7; tarsi 4."

This supposed species is by Mr. G. R. Gray placed as a synonym of *nigripes* Audubon. The dimensions and description in general accord well; and certain points of difference of coloration may be dependant upon age. It is not impossible that *gibbosa* is based upon the fully adult *nigripes*, in a plumage unknown until described by Mr. Gould. But comparisons of specimens are

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requisite to settle definitely, this point, upon which at present I have no opinion to offer.

DIOMEDEA MELANOPHRYS Boie.

*Diomedea melanophrys*, Boie, Temm. Pl. Col. No. 456. Gould, B. Aust. pl. 43; and of authors generally.

*Habitat*.—Southern Oceans generally.

The bill is moderately compressed throughout, least so at the base where it is very high or deep. The culmen is transversely rounded, non-carinated: its dorsal outline moderately concave, descending from the forehead nearly in a straight line to near the middle of the bill, whence it gradually ascends to the unguis. The latter is very convex and much decurved, though not rising so high as in some other species. The culminicorn basally descends a little on either side to overlap the roots of the nostrils, and to coalesce with the latericorn; no space of soft skin being interposed. The lateral sulcus follows very nearly the curve of the culmen, to near the unguis, where it rapidly decurves. The commissural edge of the upper mandible is lightly curved. The outline of the rami of the inferior mandible is nearly straight; the interramicorn somewhat protuberant, and extending far into the submental space. The inferior unguicorn is much compressed, not very deep, its apex rather acute, but little attenuated.

The nostrils are short and small; quite different in this feature from those of *exulans* or *brachyura*. They are subconical in general shape; being considerably dilated anteriorly, and basally narrowing to a point; their orifices considerably dilated, with thin margins; suboval in shape, looking upwards and forwards. This description of nostril is applicable to the other species of this subdivision of the genus.

The frontal feathers embrace the base of the bill in a nearly straight line; having a slight forward obliquity, however, as they descend on the sides of the upper mandible. On the culmen a very slightly reentrant curve (not angle) is formed. On the side of the lower mandible the feathers begin slightly posterior to their termination on the upper; extending somewhat forward, and with a slight convexity, as they go downwards.

The bill is yellow, more or less pure and uniform in tint; in immature birds clouded with brown. Some portion of the unguis is usually dark colored. The soft skin at the extreme base of the bill makes a narrow black line all around.

White; back plumbeous black, more cinereous anteriorly, where it merges gradually into the white of the neck. Wings and tail black; the latter with a grayish or plumbeous tinge, especially basally. Shafts of quills yellowish, becoming black terminally. Shafts of tail feathers white throughout. A cinereous black transocular fascia. "Legs and toes yellowish white, the interdigital membrane and the joints washed with blue," (Gould.)

Chord of culmen 4.25; height at base 1.75; width 1.00; from feathers on side of lower mandible to its tip 3.75. Tarsus 3.25; middle toe 4.75; outer 4.50; inner 4.00. Wing 20.00; tail 9.00; its graduation 2.00.

DIOMEDEA GILLIANA Coues, nov. sp.

Belonging to the group of white, black-backed Albatrosses of which *melanophrys* is typical, and with the characters of the culminicorn generally as in that species. The shape of the bill, however, most nearly approaches that of *culminata*; but the characters of the culminicorn posterior to the nostrils are quite diverse from those of the latter species, as follows:—

Instead of continuing, between the nostrils and the forehead, no broader than it is anterior to them, it there widens, descending on either side to overlap their roots, and to coalesce by a simple sulcus with the upper edge of the latericorn. There is thus left no space to be filled by soft skin. The dorsal 1866.]

outline of the culminicorn is not so concave as in *culminata*; does not begin to curve downwards so immediately from the forehead; does not dip so low down at the middle of the bill; is less flattened and depressed on top, and has a more decidedly rounded transverse outline. The culminicorn has considerably more of lateral extension downwards before it reaches the lateral sulcus.

The outline of the frontal feathers shows an approach to the character seen in *fuliginosa*; the root of the culmen extending nearly as far up on the forehead as in *exulans*. Still the outline is a simple concavity, not a sharp reëntrant angle. On the sides of the lower mandible the feathers start a little posterior to their termination on the upper and curve downwards and considerably forwards with a decidedly convex outline.

The base of the culminicorn and latericorn are transversely rugose; the corrugations being mainly parallel with the outline of the frontal feathers.

The lateral sulcus is gently curved from base to unguis; and on its ungual extent is less deflected than in any other species. The interramicorn is prominent; and extremely elongated before it finally loses itself in the submental space.

In the dried specimen the bill presents none of the bright parti-coloration of *culminata*, *chlororhyncha*, and *cauta*; while its color as well as its shape are sufficiently diverse from those of *melanophrys*. It is a plain uniform olivaceous brownish throughout; the unguis darker, and inclining to black; the extreme tip of the upper mandible yellowish. That this color is not an evidence of immaturity is evinced by the plumage which is palpably that of a fully adult bird.

Length of the culmen 5.00 inches. Height of bill at base 1.75; at middle slightly over one inch; at unguis 1.12. Width at base 1.45. Tarsus 3.00; middle toe 4.75, outer toe 4.60, inner toe 4.00. Wing about 20.00; tail about 9.00.

The coloration of the plumage is that of *melanophrys* and the rest of this group, with this exception: The whole under surface of the wings is concolor with the upper; whereas in the other species a large area is white.

In carefully examining the superb series of Albatrosses in the Philadelphia Academy, which contains examples of all known species except *olivaceirostris* and *gibbosa*, I find a specimen of which the preceding paragraphs are descriptive. It is unlabelled as to name, locality or donor; and Mr. Cassin has no recollection whence it was obtained. I find it impossible to refer it to any known species; and am therefore constrained, somewhat reluctantly, to regard it as a previously undescribed one. I am autopsically familiar with all the recognized species except *olivaceirostris* and *gibbosa*. The former of these is said to have a bill "3 inches and three-eighths long from the gape to the tip, and of a uniform olive green, and in form more slender and elegant," etc.; with which description the characters of our bird are totally discordant. There is no "peculiar swollen and raised form of the upper mandible" suggestive of the name *gibbosa*, or rendering its reference to that species admissible.

From *chlororhyncha*, *culminata*, and *cauta* it is at once distinguished by the color of the bill and especially by the lateral extension downwards of the base of the culminicorn, and its coalescence with the latericorn, thus cutting off the naked space which exists behind the nostrils of these species.

Agreeing in this latter respect with *melanophrys*, the shape no less than the coloration of the bill, as well as the peculiar color of the under surfaces of the wings forbid its reference to that species. Until these features are shown to be accidental, or not incompatible with the variations to which *melanophrys* is subject, the species must be regarded as a valid one; since there are no others than those above compared, to which it bears any sort of resemblance.

I trust that this species may prove valid, if for no other reason than that it may continue to bear the name I have fixed to it in pleasant remembrance of years of uninterrupted friendly intercourse; although Professor Theodore Gill needs no such slight tribute from me, to enhance the enviable reputation to

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which his extensive researches in almost every department of Zoology so justly entitle him.

DIOMEDEA CAUTA Gould.

*Diomedea cauta*, Gould, P. Z. S. viii. p. 177. Id. Ann. Mag. Nat. Hist. xiii. 1844, p. 360. Id. B. Aust. pl. 40. Gray, Gen. Birds, (plate of bill), and of authors.

*Habitat*.—From the south coast of Van Diemen's Land.

A beautiful species having the colors of plumage of the *melanophrys* group; readily distinguishable from all other species by the following peculiarities in the shape and color of the bill, and outline of the frontal feathers.

The frontal feathers lie in a straight or slightly convex outline across the base of the culmen, and then descend perpendicularly to the commissure; forming a slight reentrant angle on each side of the base of the culminicorn. From exactly opposite their termination on the commissural edge of the upper mandible those on the lower start, and descend in a straight line with a slight forward obliquity, forming a very obtuse angle with those on the upper mandible.

The dorsal outline of the culmen descends from the forehead with a gentle curve, to rise again on the unguis, but not so high as at the forehead. The point of greatest concavity is opposite the middle of the bill. Basally the culminicorn agrees with that of *culminata* and *chlororhyncha*, and differs from *melanophrys*, in not widening behind the nostrils, nor descending to overlap their bases and meet the upper edge of the latericorn; a narrow subrectangular space thus left being covered only with soft skin.

The latericorn is very broad throughout as compared with the culminicorn; i. e., the lateral sulcus is placed high up. The latericorn is exceedingly deep at its base, running high up towards the sides of the base of the culminicorn, and, in consequence of the strong upward inflection of the commissure towards its base, the sides of the under mandible are also very deep basally, and run high up to form an acute angle with the feathers at the commissure.

The nostrils present no discrepancies from other species of this group.

"Bill light vinous gray or bluish horn color, except on the culmen where it is more yellow, particularly at the base; the upper mandible is surrounded at the base by a narrow belt of black, which also extends on each side of the culmen to the nostrils; base of lower mandible surrounded by a belt of rich orange, which extends to the corners of the mouth." (Gould.)

Chord of culmen 4.75; height at base 1.99; width 1.25; height at unguis 1.25; from feathers on lower mandible to the tip of its unguis 3.75. Tarsus 3.25; middle toe 5.00; outer toe 4.75; inner 4.25; wing 22.00; tail 10.00.

The plumage is that of *melanophrys* even to the transocular dark fascia; but this in the specimen before me extends quite to the bill, which is not the case in the numerous specimens of *melanophrys* examined.

A suffusion of the head and neck with pearly gray is doubtless indicative of immaturity, as is the case with other species.

This bird is superbly figured in Mr. Gould's and Mr. Gray's plates cited above. The latter is an exceedingly accurate delineation of the bill.

DIOMEDEA CULMINATA Gould.

*Diomedea chlororhynchos*, of Audubon's Works; witness the type specimen itself. Lawrence, Gen. Rep. Birds, N. A., 1858, p. 822. (Excl. syn.)

*Diomedea culminata*, Gould, Ann. & Mag. N. H. 1844, xiii. p. 361. Id. B. Aust. vii. pl. 41. Gray, Gen. Bds., 1849, pl. 179.

This species in color of plumage is quite identical with *chlororhyncha*, and the bill, in its general characteristics of shape, most resembles that of the latter species. But the bird is much larger, stouter and heavier, as will be seen by comparing the dimensions given. The bill in general terms may be stated to be heavier and stronger, though not longer than that *chlororhyncha*; 1866.]

much less compressed; deeper at the middle, notwithstanding that the concavity of the culmen is much greater; and with other well-marked peculiarities, as follows:—

The dorsal outline is exceedingly concave, dipping down rapidly from the forehead, and then again being much elevated on the ungual portion. The culminicorn is broad, flattened, depressed, with no trace of carination. Its colored base, instead of being acutely pointed, (as in *chlororhyncha*.) continues of a uniform width past the nostrils to the feathers, where it is broadly rounded with a gentle convexity. There exists posterior to the nostrils a naked space of soft skin; but this is trapezoidal, not triangular in shape, in consequence of the different shape of the base of the culminicorn, just described.

The lateral sulcus is nearly straight to the unguis, where it is greatly deflected. It runs high up along the bill; or rather the dorsal outline of the culmen dips, towards the middle of the bill, so far down, that it almost lies on a level with this sulcus. The culminicorn is thus allowed scarcely anything of a lateral aspect in the middle portion of its extent. The latericorn, as a consequence, is very deep throughout, and its commissural outline is decidedly less curved. The two unguis are stout, deep and short; with considerable more convexity of outline, and less elongation and decurvation of their apices than is seen in *chlororhyncha*.

The dorsal outline of the inferior mandibular rami is quite straight. The interramicorn is prominent, but not so long as in *chlororhyncha*.

The outline of the feathers is almost exactly as in *melanophrys*; i. e., they lie over the base of the culmen in nearly a straight line, or with a slight concavity; and thence extend nearly straight down the sides of the bill. There is no trace of the reëntrant angles at the sides of the base of the culminicorn seen in *chlororhyncha*. The feathers on the lower mandible have the same outline as those of *melanophrys* or *chlororhyncha*.

The colors of the bill are quite different from those of any other species, though coming nearest to *chlororhyncha*. The culminicorn is clear light yellow; (not bright orange;) and the edges of the inferior mandibular rami for three-fourths their extent are also yellow. There is no yellow line along the sides of the base of the lower mandible at its junction with the feathers. The rest of the bill is black. "In its youthful state the head and neck are dark gray, and the bill is of an almost uniform brownish black, with only an indication of the lighter color of the culmen." (Gould.)

The plumage is quite the same as that of *chlororhyncha*. The color of the back is darkest posteriorly, being anteriorly more plumbeous, and shading into the grayish pearl which washes the neck and head of the majority of specimens. Usually the feathers about the eyes are more or less dark-colored.

In young birds the whole head and neck is clouded with plumbeous gray; and the transocular fascia is more conspicuous.

Bill (chord of culmen) 4.50; height at base 1.75; at middle 1.10, at unguis 1.25; width at base 1.20. Tarsus 3.25; middle toe 5.00, outer toe 4.75, inner toe 4.25. Wing 21.00. Tail 8 to 9.

I have before me Audubon's type of the "*chlororhynchos*" of his works. It is an example of *culminata* Gould; and was doubtless procured elsewhere than "not far from the Columbia River," as falsely stated. This specimen (No. 2726 of the Smithsonian Register) is also described by Mr. Lawrence, i. e., under the same name.

I have a distinct impression of having seen, in some old work, a plate of this species (as evidenced by the yellow along the ramus of the under mandible instead of at its feathered base) under the name of "*chlororhynchos*;" but I cannot now call to mind the reference.

#### DIOMEDEA CHLORORHYNCHA Gmelin.

*Diomedea chlororhyncha*, Gm. i. 1788, p. 568. Lath. Syn. v. p. 309, pl. 94.

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Lath. Ind. Orn. ii. 1790, p. 790. Temm. Pl. Col. 468. Gould, B. Aust. pl. 42, and of authors generally; but not of Audubon and Lawrence.

*Diomedea (Thalassarche) chlororhyncha*, Bp. C. A. ii. 1855, p.

"*Diomedea chrysostoma*, Forst. Ed. Licht, 1844, p. 24. "Id. ic. ined. 100, 101," fide Gray.

"*Diomedea profuga*, Banks, ic. ined. t. 27," fide Gray.

"*Diomedea presaga*, Brandt," fide Lawrence.

*Habitat*—Cape of Good Hope, and thence to Van Diemen's Land. Australian and South Pacific Oceans generally.

The bill is compressed in its whole extent more than in any other species except *fuliginosa*; and although somewhat stouter at the base, it is there very high as compared with its width. Its dorsal outline is very concave, descending rapidly from a point a little anterior to the extreme base of the bill, to about the middle; and not rising again very high on the unguis. Although the culmicorn is narrow and with compressed sides, it is not carinated along its dorsal line. It has a peculiar termination basally, quite unique in the genus, which single character separates it trenchantly from any other Albatross. The culmicorn does not (as in *exulans*, *melanophrys*, etc.,) spread downwards and outwards behind the nostrils to overlap their bases, but terminates by rapidly narrowing to an acute angle on the median line of the bill. Its hard, brightly colored, pointed base does not quite reach to the feathers. There is thus left, between the base of the culmicorn and the upper edge of the latericorn, a somewhat triangular space of softish integument, not brightly colored; and corrugated in the dry state.

The lateral sulcus on the upper mandible does not extend further towards the base of the bill than the nostrils: the soft skin just spoken of taking its place thence to the feathers. Beginning then with the nostrils, it has a slight downward convexity as far as the unguis; thence it is greatly deflected. As usual, a slight ridge lies in this sulcus for its whole length. The commissural edge of the upper mandible is strongly curved, its convexity looking downwards. The dorsal outline of the inferior mandibular rami is straight or very slightly concave. The interramicorn is thin, not very prominent, but prolonged far along the chin before it merges into soft skin.

The two ungues, taken together, are characterized by their slight comparative depth and degree of convexity, and their extreme compression and elongation; and by the acuteness and decurvation of their apices.

The nostrils are exactly as described under *melanophrys*.

The frontal feathers are peculiar in outline. They lie straight across the base of the culmen, or even have a slight convexity, as far as the upper corner of the base of the latericorn. Thence they descend the side of the bill, with a slightly convex outline, and some little obliquity forwards; forming more decidedly reëntrant angles at the superior basal corners of the latericorns than is found in any other species. On the side of the lower mandible, beginning at a point slightly posterior to their termination on the upper mandible, they descend with an outline parallel to that of those on the upper mandible.

Chord of culmen 4.50; height of bill at base 1.50, at unguis 1.00; width at base 1.00. Tarsus 2.75; middle toe 4.25; outer toe 4.00; inner toe 3.75. Wing about 19.00. Tail 7.00.

White; including rump, upper tail coverts and under surfaces of the wings; back and wings ashy brown, the latter darkest. Primary shafts light brown basally, black apically. Tail grayish or plumbeous black, lightest basally; its shafts chiefly white. Some part of the head and neck in the majority of specimens is clouded with pearly gray. There is more or less of a grayish plumbeous transocular fascia, as in *melanophrys*. The culmicorn is bright orange yellow; and a narrow line of the same color lies along the sides of the base of the under mandible. The rest of the bill is blackish; there being no bright color along the dorsal outline of the inferior mandibular rami, as seen in *culminata*. The feet are livid flesh, or bluish white.

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Some malapplications of the name of this species to *culminata* Gould, are noticed under the head of the latter. I quote the names "*profuga* Bauks" and "*presaga* Brandt" respectively on the authority of Mr. Gray and Mr. Lawrence, not having an opportunity of verifying these references.

DIOMEDEA OLIVACEIROSTRIS Gould.

*Diomedea olivaceorhyncha*, Gould, Ann. Mag. N. H. 1844, xiii. p. 361. Id. Introd. B. Aust., p. 115.

*Diomedea olivaceirostris*, Bonaparte, C. A. 1855, p. 185, correcting a hybrid name.

This species is based upon a bill only, which was in possession of Sir Wm. Jardine, and supposed to come from the China seas. Mr. Gould states that it "is three inches and three-eighths long from the gap to the tip, of a uniform olive green, and in form more slender and elegant than that of the other members of the genus," which comprises the sum total of our knowledge concerning the species.

PHÆBETRIA FULIGINOSA (Gm.) Reich.

*Diomedea fuliginosa*, Gmelin, Syst. Nat. i. pt. ii. p. 568. Lath. Ind. Orn. ii. 1790, p. 791. Temminck. Pl. Col. 469. And of authors generally.

*Diomedea (Phæbetria) fuliginosa*, Bonap. Consp. Av., ii. 1855, p.

*Diomedea spadicea*, Lesson, Man. ii. 1828, p. 391; description. Not of Lath.

*Diomedea palpebrata*, Forster, "ic. ined. No. 102." Id. Ed. Licht, 1844, p.

*Diomedea antarctica*, Banks, "ic. ined. No. 26."

*Diomedea fusca* of Audubon's works.

*Habitat.* Southern oceans at large.

The bill of this species is remarkable in its extreme compression; its basal outline; and the presence of a sulcus on the lower mandible.

The feathers retreat rapidly, with a gentle curve, from their point of greatest development on the commissural edge of the upper mandible to form an exceedingly acute reëntrant angle on the forehead. Those on the side of the lower mandible extend in an exceedingly acute salient angle, to a point much beyond the termination of the nostrils; their upper outline a trifle oblique to the commissural edge of the lower mandible; their under more decidedly oblique to the outline of the inferior mandibular rami.

The culmicorn is much compressed, with but slightly convex sides, and a decidedly carinated ridge. The dorsal outline forms a gentle and continuous curve from the very feathers to the base of the unguis. The latter hardly rises above the level of the culmen proper: is rather the reverse of robust; its top moderately decurved, and only slightly overhanging the lower. The curve of the superior lateral sulcus is intermediate between *exulans* and *brachyura*. The commissure forms a gentle and continuous curve from the base of the unguis.

The commissural edge of the under mandible corresponds to that of the upper. The dorsal outline of the rami is perfectly straight. The inferior unguicorn is convex and protuberant, but extends only a short distance into the mental space.

The median longitudinal lateral sulcus of the lower mandible terminates abruptly at the unguis. Basally it divaricates to receive the salient feathers; the upper crus being the best marked, and forming the real continuation of the sulcus. This groove is sometimes concolor with the bill; more often it is brightly colored, being yellow or pinkish.

The nostrils are peculiar in their very small calibre, perhaps less than that of any other species. They are almost buried between the culminal and lateral elements of the bill, the two meeting posterior to the nares. The orifice is subcircular, presenting forwards and upwards with no lateral aspect.

The graduation of the lateral rectrices is enhanced in producing a cuneate tail, by the elongation of the median pair which project beyond the next ones, and are narrowly acuminate. The tips of the lateral feathers are rounded.

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The bill is black, except its sulcus. The feet are flesh colored or dull whitish, becoming yellowish in the dried state. The edges of the eyelids are pure white except just at the anterior canthus.

The perfectly and uniformly fuliginous color (darkest about the face and on the wings and tail) which is the ordinary plumage, sometimes gives way to a much lighter, clearer and more cinereous color. Examples of this coloration, doubtless due to age, are in the Philadelphia Academy and Smithsonian Institution. The most extreme case I have met with is as follows: Neck all around, upper part of back and whole under parts nebulated with ashy or grayish white. Lower part of back, wing-coverts, scapulars, etc., light plumbeous gray. Wings and tail ashy or plumbeous blackish, lightest on their inner webs, their shafts chiefly whitish. On the face, crown and sides of the head the fuliginous holds, deepest in tint immediately around the bill. The nape and hind neck, and some of the wing coverts show traces of ferrugineous.

Chord of culmen 4 to 4.50, height of bill at base 1.50, at unguis 1.00, width at base .75. From feathers on commissure to tip 3.50, from feathers on lower mandible 2.50. Tarsus about 3.00; middle toe and claw 4.75, outer 4.50, inner 4.00. Wing 21.00, tail .10, its graduation 3.50 to 4.50.

I have examined the type of *Diomedea fusca* Aud. now in the Smithsonian Institution.

The following is a synopsis of the genera and species of the *Diomedeinæ*.

Family *PROCELLARIIDÆ*.

Sub-family *DIOMEDEINÆ*.

*Chs.* The tubular nostrils are separated, and placed on either side of the culmen. The hallux is absent. The exterior toes have a wide membranous fringe.

Genus I. *Diomedea*. Bill stout, or moderately compressed. No sulcus on lower mandible. Tail short or moderate, more or less rounded. Nostrils large.

A. Bill very broad. Tail short; contained nearly, quite, or more than three times in the wing.....*Diomedea et Phœbastris* Reich.

1. *D. EXULANS* L. (*spadicea* Gm. Lath. (juv.) *albatrus* Pall. Forst., *adusta* Tsch. Bill 7 inches. Frontal feathers forming a deep concavity on the culmen; those on side of lower mandible extending to a point opposite middle of nostrils, with an exceedingly convex outline.

2. *D. BRACHYURA* Temm. (*spadicea* var. B. Lath. (juv.) *epomophora* Less. Tsch. Bp.) Bill 5 to 6 inches. Frontal feathers embracing the bill nearly in a straight line: those on side of lower mandible extending hardly further than on upper, with a barely convex outline.

[2a? *D. LEPTORHYNCHA* Coues. Doubtfully based upon a skull differing somewhat in proportions from that of *brachyura*. See anteà.]

3. *D. NIGRIPES* Aud. (*brachyura* juv. Cass. Lawr.) Bill 4 inches; width at base 1.25; height 1.50; very robust for its length. Frontal outline nearly as in *brachyura*.

? 4. *D. GIBBOSA* Gould. "With a peculiar swollen and raised form of the upper mandible, which moreover rises high up on the forehead. Bill 4." (Probably = *nigripes* Aud.)

B. Bill compressed. Tail elongated, rounded, nearly half as long as the wing from the carpal joint. White, with black back and wings. A transocular fascia.....(*Thalassarche* Reich.)

a. The culminicorn widens and descends on either side behind the nostrils to coalesce with the latericorn.

5. *D. MELANOPHRYS* Boie. Temm. Frontal feathers with a slight reëntrant curve on the culmen. Chord of culmen 4.25. Width of bill at base 1.00; height 1.75. Bill uniform light yellow.

6. *D. GILLIANA* Coues. Frontal feathers with a decided reëntrant curve on the culmen (nearly as great as in *exulans*.) Chord of culmen 5.00; width of bill at base 1.45; height 1.75. Bill uniform dark brown. (Essential characteristics of culminicorn of *melanophrys*; general shape of bill of *culminata*.)

b. The culminicorn does not widen and descend to coalesce with the latericorn posterior to the nostrils, but continues narrow to the frontal feathers.

7. *D. CAUTA* Gould. Chord of culmen 4.75. Frontal feathers with a slightly convex outline across the culmen: thence descending in a nearly straight line. Bill gray or bluish brown; the culmen yellowish; a narrow belt of black around base of upper mandible; one of orange around base of lower, the latter extending to the angle of the mouth.

8. *D. CULMINATA* Gould. (*chlororhyncha* Aud. Lawr. nec. Gm.) Base of culminicorn broad and rounded. Frontal feathers with a slightly concave outline across culmen. Chord of culmen 4.50. Bill black; culmen and lower edges of inferior mandibular rami bright yellow.

9. *D. CHLORORHYNCHA* Gm. (nec. Aud. Lawr. *chrysostoma* Forst. "*profuga* Banks;" "*presaga* Brandt.") Base of culminicorn tapering to an acute angle. Frontal feathers straight or with slight convexity across culmen: thence downwards with some forward obliquity, and slight convexity of outline, forming a sharp reëntrant angle at upper corner of base of latericorn. Chord of culmen 4.50. Bill black. Culmen, and a narrow perpendicular line along the sides of the base of the under mandible, bright yellow.

10. *D. OLIVACEIROSTRIS* Gould. Bill slender, uniform olive green, three and three-eighths long from gape to tip.

GENUS II. *PHÆBETRIA* Reich. Bill excessively compressed. A sulcus on sides of lower mandible. Feathers forming a deep reëntrant angle on culmen; an acute salient on one side of lower mandible. Nostrils very narrow. Tail elongated, cuneate.

11. *P. FULIGINOSA* Reich, ex *Diomedea fuliginosa* Gm. (*antarctica* Banks; *palpebrata* Forst.; *fusca* Aud.) Height of bill at base 1.50, width .75. The culmen is carinated for its basal half.

#### Sub-family *HALODROMINÆ*.

Some general remarks upon the fundamental characters of this interesting group have already been given at the head of the present article. We may at once proceed to the consideration of the single genus by which it is represented.

#### Genus *PELECANOIDES* Lacép.

*Procellaria* sp. Gmelin et auct. aliq.

*Pelecanoides*, Lacépède, Mem. de l'Inst. 1800-1, p. 517. Typus *Proc. urinatrix* Gm.

*Haladroma*, Illiger, Prodromus, 1811, p. 273. Typus idem.

*Onocralus*, Rafinesque, 1815; fide Bon.

*Puffinuria*, Lesson, Man. 1828, ii, p. 392: Id. Traité Ornith. 1831, p. 614. Typus *P. Garnoti* Less.

Concerning these numerous names which have been proposed for this genus

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the preponderance of authority is in favor of the adoption of that of Illiger. I can, however, discern no cause why Lacépède's name should be superseded. The reasons given by Illiger, in proposing *Haladroma*, and by Lesson in founding *Puffinuria*, certainly seem invalid. To G. R. Gray is, I believe, due the credit of restoring the rightful appellation of Lacépède.

The type which represents the genus, although so curiously anomalous, is so well known, that a detailed description would be out of place here. Only a few of its more salient points need be noticed.

The perfectly vertical nostrils are surrounded by an elevated wall, whose contour, in consequence of a slight emargination posteriorly, and a corresponding protuberance anteriorly, on the median line, is somewhat cordiform. The wall has considerable thickness basally; but much bevelling superiorly gives it an extremely thin edge. The internasal septum is moderately thick; and from either side a process projects transversely into the nasal orifice. In shape each nostril is suboval; being somewhat elongated anteriorly, and a straightening of its inner border being produced by their mutual apposition.

The dertrum or unguis is long, reaching quite to the nostrils; and, for this family, is only moderately uncinated. Except at its extreme base it is distinctly carinated, and its sides are much compressed.

The myxa is unusually small and narrow, with a very acute tip, and extremely concave gonys. The sulci separating the myxotheca from the rest of the mandible, and the lateral one on the gnathidia are strongly marked.

The unusual amount of divarication of the concavo-convex gnathidia, which causes so wide a submentum, is, in the upper mandible, accompanied by a corresponding dilation of the lateral elements; which latter are also turgid and inflated.

The tarsus is excessively compressed, and at the same time very deep antero-posteriorly; giving to its transverse section a narrowly elliptical shape, like that which obtains in the *Colymbidæ*. It is reticulated as in the *Procellaridæ*, and also the majority of the *Alcidæ*, though *Mergulus* has anteriorly transverse imbricated scales. The proportions of the anterior toes are as in the other *Procellariidæ*.

In the wings and tail the urinatorial aspect is most decidedly marked. The very short wings, with their stiff, falcate, subacuminate\* primaries hardly reach to the end of the exceedingly abbreviated tail.

The plumage is essentially diverse from that of any other Procellaridian, in its compact imbrication, and oily glossiness, which comes nearest to that of the Loons; and is eminently adapted to resist the action of the water in which the habits of this species cause them so constantly to be submerged.

Concerning the number of species to be enumerated authors are greatly at variance. To a comparatively recent date but a single one was supposed to exist. M. Temminck, in figuring the type of MM. Quoy and Gaimard's *P. Berardii*, is of opinion that both *urinatrix* and *Garnoti* should be referred to it. M. Lesson, after describing *Puffinuria Garnoti* in 1826, doubtfully refers it to *Proc. urinatrix* Gm.\* Prince Bonaparte unites *Garnoti* and *urinatrix*, and considers *Berardii* as distinct. Mr. G. R. Gray, and more recently, Dr. H. Schlegel, agree in regarding all three of the supposed species as valid. A sufficient amount of material is not at my disposal to settle these doubtful points. In a considerable number of specimens from various localities I can see what has been called *P. Berardi*, differing in some respects from the ordinary type: but have failed to detect tangible differences indicating three species. Very possibly, however, none of the specimens before me indicate the true *urinatrix*, as distinguished from *Garnoti*.

The three supposed species are based entirely upon size: a varying degree of length or robustness of bill: and coloration of the feet. Some specimens

\* *Traité d'Ornith.* 1831, p. 720, No. 144.

before me are larger than is indicated by Dr. Schlegel as characteristic of *Garnoti*: while the feet are colored as in the smallest species, *Berardii*. A considerable amount of variation is found in examples of undoubtedly the same species; so that perhaps we might without great violence consider the different species as extremes of a single very variable type.

I am mainly indebted to Dr. Schlegel's excellent article for characters whereby to tabulate the supposed species with their synonyms. This author has had before him examples which he has considered as indicative of three species: and for the present I rely upon his judgment.

1. PELECANOIDES GARNOTI Gray ex Lesson.

*Puffinuria Garnoti*, Lesson, Voy. de la Coq. i. part ii. 1826, pl. 46.—(Bill and feet black. Length  $8\frac{1}{2}$ ; extent 16; bill 1 2-12ths; wing 5; feet and tail each  $1\frac{1}{2}$ .)—Id. Man. Orn. 1828, ii. p. 394.—Id. Traité d'Orn. 1831, p. 730. (Queries *urinatrix* Gm. as syn.)

*Pelecanoides Garnoti*, Gray, Gen. Birds, iii. 1849, p. 646.

*Haladroma Garnoti*, Schlegel, Mon. Proc. Mus. Pays-Bas, p. 37.

*Haladroma urinatrix*, Bonaparte, C. A. 1856, ii. p. 206. (Excl. syn. Nec Gm. fide Schlegel, who has examined Bonaparte's types.)

*Habitat*.—West Coast of South America.

*Chs.* Largest; 8 to  $8\frac{1}{2}$  in length. Bill slender and elongated; black; along culmen .75; height at end of nasal case .25. Width near the base .33. Tarsus blackish, 13 to 14 lines long; middle toe about one inch.

2. PELECANOIDES URINATRIX Lacép. ex Gm.

*Procellaria urinatrix*, Gmelin, S. N. 1788, i. part ii. p. 560, and of authors; not *Hal. urin.* of Bp.

*Pelecanoides urinatrix*, Lacép. et Cuv. Gray, Gen. Birds, iii. 1849, p. 646.

*Haladroma urinatrix*, Illiger, Prod. 1811, p. 274. Schlegel, Mon. Proc. Mus. Pays-Bas, 1863, p. 37.

*Puffinuria urinatrix*, Gould, B. Aust. pl. 60.

*Haladroma Berardii*, Bonap. C. A. 1856, ii. p. 206; Excl. syn. (fide Schlegel; from examination of Bp's types.)

*Procellaria tridactyla*, Forst. Descr. Anim. Ed. Licht. 1844, p. 1849.

*Habitat*.—Australian Seas.

*Chs.* Of medium size; feet bluish; bill robust. Wing 4.50; tail 1.40. Bill .66; its height or width .33; tarsus one inch. Middle toe eleven lines.

3. PELECANOIDES BERARDII Q. and G.

*Pelecanoides Berardii*, Quoy and Gaim. Voy. Uranie, pl. 37. Temminck, Pl. Col. No. 517. Gray, Gen. Birds, 1849, iii. p. 646.

*Haladroma Berardii*, Schlegel, Mon. Proc. Mus. Pays-Bas, 1863, p. 38; not of Bonaparte.

*Habitat*.—Southern Oceans.

*Chs.* Smallest; bill short, intermediate in robustness between that of the two foregoing; feet light colored, their membranes black. Length 7 inches; wing 4.40; tail 1.50. Bill .55, its height or width about .30. Tarsus .80; middle toe .90.

It will be observed that the differences between the size of the smallest and largest of these supposed species is not great; that an intermediate form occurs between the two extremes; that each is liable to considerable variations in size; and that the colors of the plumage of all three are identical.

*Recapitulation.*

The following is a summary of the genera and species of *Procellariidae* treated of in the series of papers of which the present article is conclusive. The numbers in the third column are those of species which I have recognized, but which seem to require confirmation before their claims to validity can be considered as fully established. It will be seen that more or less of doubt attaches to 17 out of the 92 described.

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	Genera.	Species.	Doubtful Species.
Procellariinae			
Fulmaræ.....	3	6	
Æstrelatæ.....	3	23	6†
Prionæ.....	3	6	1‡
Procellariæ.....	7	21	5
Puffinæ.....	5*	21	1§
Diomedeinæ.....	2	12	2¶
Halodrominæ.....	1	3	2**
Total.....	24	92	17

NOTE. The following supposed species are not given in the body of my papers; and I only know of them by the descriptions.

*Puffinus Rollandii* Quoy and Gaimard, in Freynete, Voy. Antour du Monde; and Zool. Journ. iii. p. 271.

*Procellaria lugubris*, Tschudi, Cab. Journ. f. Ornith. 1856, iv. p. 185, (not of Natterer.) "The whole body is dark brown; the back somewhat deeper colored than the belly; the tail wholly black; the inner side of the wing darker than the outer. Bill and feet reddish; iris ashy gray. Surpasses in size *capensis*; also compressed in form. The description of *P. antarctica* is too inaccurate to say with certainty if it be the species here described. Between 46° and 36°." (*Tschudi*, ut supra.) It is impossible to say from the description what species of *Nectris* or *Pterodroma* this is.

*Procellaria maculata*, loc. cit. "Island of Juan Fernandez; 33° S. Head, breast and belly wholly white; the back bluish-white with darker spots, the wings gray with bluish spots, the tips of the four longest primaries wholly black. Tail fan-shaped, grayish blue. Bill and feet deep orange yellow. Iris dark brown. About the size of the preceding species." Evidently an *Æstrelata*; but the description applies to no species with which I am acquainted. It comes nearest to *alba* Lath, or *Lessonii* Garnot.

*Procellaria bicolor*, op. cit. p. 187. "Bill and feet black; neck, back, and lesser wing coverts deep blackish gray, wing feathers and tail somewhat lighter. Head and throat wholly black; belly pure white." Doubtless a young *Æstrelata*; but of what species the description gives no hint.

#### SUPPLEMENT.

Some few additions to, and corrections of my previous papers, which subsequent investigation has brought to my knowledge, may with propriety be inserted here.

##### *Procellariæ.*

P. 79, line 25, for "size" read "length." *H. microsoma* is rather smaller than *P. pelagica* in actual size of body, though the length of wings and tail is not less. This explains an apparent discrepancy in my statements on p. 79 and p. 90.

\* I would now unite *Thielus* and *Nectris* with *Puffinus*, leaving but three genera to be recognized.

† These six are *Bulweria Macgillivrayi* and *Procellaria Parkinsoni*, Gray; *P. neglecta* and *P. incerta* Schl.; *Æstrelata grisea* and *Æ. gavia* of my paper.

‡ *Prion brevirostris* Gould.

§ Which are *P. tethys* Bp., *P. lugubris* Natterer, *P. m-litensis* Schembri; *Thalassidroma Segethi* Ph. and Ldbk.; *Fregetta Laurencii* Bp.

¶ *P. sericeus* Less.

¶ *D. gibbosa* Gould, which may be *nigripes* Aud., and my *D. leptorhyncha*.

\*\* As just stated, the three recognized species of *Pelecanoides* require additional evidence to prove conclusively that they are not merely the extremes of a single variable species.

1866.]

Pp. 80, 81, 90. There can be no doubt of the propriety of referring *P. lugubris* Natterer, and *P. melitensis* Schembri, to *pelagica* L. *Proc. tethys* Bp., also seems hardly distinct.

Pp. 81, 90. *Thalassidroma fasciolata* Tschudi has been recognized by other writers as valid.

Pp. 84, 91. *Oceanites segethi* ex Ph. et Ldbk. is undoubtedly a synonym of *O. gracilis* ex Elliot, as intimated in my paper.

Pp. 87, 91. *Fregetta Lawrencii* Bp. is probably a synonym of *grallaria* Bp. ex Vieill. as Mr. Lawrence himself originally believed. The point cannot now, however, be positively determined, as the specimen is lost.

Pp. 88, 91. Bonaparte's identification of Linnæus' *Proc. fregata*, which I followed, is by no means proven; and in view of the uncertainty attaching to Linnæus' diagnosis (which may refer to some species of the genus *Fregetta*) it may be as well to take our specific name from Latham's unequivocal indication of *P. marina*; calling the species *Pelagodroma marina* after Reichenbach.

#### *Puffinæ.*

Pp. 122, 142, 143. Genera "*Thiellus*" and "*Nectris*." The points in which these groups differ from *Puffinus* proper, are exceedingly trivial, as I state in my paper. I am now indisposed to retain them, even on the plea of utility, and would accordingly unite all their species under *Puffinus*.

Pp. 119, 141. *Adamastor* Bp. According to Mr. G. R. Gray the type of the genus *Priofinus* of Hombron and Jacquinot is based upon the bird Bonaparte calls *Adam. typus*, and it has priority over Bonaparte's designation. If this be the case the three species should stand as *Priof. cinereus*, *Priof. gelidus* and *Priof. sericeus*.

Pp. 118, 141. *Majaqueus* Reich. If *Proc. Parkinsoni* Gray, (Ibis 1864) is a valid species, it may belong to this genus rather than to the fuliginous group of *Æstrelata* under which I have considered it. Additional data concerning it are greatly to be desired.

P. 121. Add *Daption gelidum* Steph. Shaw's Gen. Zool. xiii. p. 245, to synonyms of *Adamastor gelidus*.

P. 123. *Puffinus fuliginosus*. I have received specimens from the Pacific coast of North America which I cannot distinguish from the common Atlantic bird. It is quite different from the species I have named *Puffinus amaurisoma*, p. 124. By a misapprehension of a remark of Dr. Kuhl, I erroneously state that *fuliginosa* Forst., Descr. sp. 18, is a species of *Nectris*; whereas I am now satisfied it is the same as Kuhl's sp. 12, which is the *Pterodroma atlantica* of Bonaparte. Compare my remarks under *Æstrelata fuliginosa* in part iv. of these papers. Kuhl's *fuliginosa* sp. 27, after Banks' tab. 23, is identified by Mr. Gray with *pacifica* Lath.

P. 126. *N. carneipes*. On the authority of Dr. Schlegel I placed *cinereus* juv. Smith, and *gama* Bp. as synonyms of this species. Mr. Gray considers them as referring to a species of *Nectris* or rather *Puffinus* not recognized in my paper, viz.: *P. tristis* Forst. I am entirely unacquainted with this bird, if it be a valid species. Bonaparte and Schlegel make it the same as *tenuirostris* Temm.

Pp. 131, 144. A second specimen of *Puffinus creatopus* has been received from the same locality.

Pp. 141, 144. *Procellaria nugax* Sol. This unpublished specific name should not take precedence over *assimilis* of Gould.

#### *Fulmaræ.*

Add *Fulmarus antarcticus* Steph. Shaw's Gen. Zool. 1825, xiii. p. 236, to the synonyms of *Thalassoica glacialis*.

Add *Daption antarcticum* op. cit. p. 242, to synonyms of *Thalassoica antarctica*.

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## BIBLIOGRAPHICAL APPENDIX.

It may be well to give in this connection a synopsis of the works of some of the older authors, as far as they relate to the subject in hand. The earlier authorities to be particularly consulted in a study of the *Procellariidæ*\* are the following :—

LINNÆUS, *Syst. Nat. ed.* 10 (1758.)

In this edition, the first in which species are presented, there are named (p. 131) three species; sc. *pelagica*, (type of genus *Procellaria*;) *æquinoctialis* and *capensis*.

LINNÆUS, *Syst. Nat. ed.* 12, vol. i. (1766.)

1. *Proc. pelagica*, p. 212.

2. *Proc. fregata*, p. 212. I followed Bonaparte's authority in referring this name to the species subsequently named *marina* by Latham; but there seems to be nothing in the Linnæan diagnosis requiring this identification; the name being very probably based upon some species of the genus *Fregatta* as now restricted.

3. *Proc. glacialis*, p. 213, = *Fulmarus glacialis* Leach.

4. *Proc. æquinoctialis*, p. 213, = *Majaqueus æquinoctialis* Reich.

5. *Proc. capensis*, p. 213, = *Daption capensis* Steph.

6. *Proc. puffinus*, p. 213, = probably *P. anglorum* (Ray,) Temm. Has been identified also with *P. Kuhlî* Boie, and *P. major* Fab., and almost every other Atlantic *Puffinus*.

GMELIN, *ed. Linn. Syst. Nat.* vol. i. part. ii. (1788.)

7. *Proc. obscura*, p. 559. One of the smaller *Puffini*, the habitat of which is given as "insula nativitatis Christi." Now universally applied to the common-bird of the Atlantic, called *obscura* by Vieillot, *Nouv. Dict.* p. 423, in 1817.

8. *Proc. pacifica*, p. 560. Not identified with any other known species. A large *Puffinus*, from the island of Euopoa.

9. *Proc. cœrulea*, p. 560, = *Halobœna cœrulea* Bp.

10. *Proc. vittatus*, p. 560, = *Prion vittata* Lacép.

11. *Proc. urinatrix*, p. 560, = *Pelecanoides urinatrix* Lacép.

1. *Proc. pelagica*, p. 561. Variety B. is probably fictitious.

2. *Proc. fregata*, p. 561. Same as that of Linnæus.

12. *Proc. furcata*, p. 561, = *Oceanodroma furcata* Reich.

13. *Proc. fuliginosa*, p. 562. Based upon Latham's species of this name, and not yet identified. A small species, eleven inches long, with a forked tail; from Otaheite. Generally supposed to be a species of *Thalassidroma*.

14. *Proc. desolata*, p. 562. Now recognized as a valid species of *Æstrelata*.

15. *Proc. nivea*, p. 562, = *Pagodroma nivea* Bp.

16. *Proc. melanopus*, p. 562. Not identifiable, except opinionatively. Evidently some species of *Æstrelata*. Said to come from North America, which would make it referrible to *Æ. hesitata*. Description applies in most respects to *mollis* Gould.

3. *Proc. glacialis*, p. 562, = *Fulmarus glacialis* Leach. The var. B. is the *Thalassoica glacialis* (Smith) Reich.

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\*The indications of the *Diomedæ* are generally so definite that the consideration of them may be here omitted.

17. *Proc. cinerea*, p. 563. A stumbling block, concerning which authors are greatly at variance. Usually employed by European authors as the name of the species I describe as *Puffinus Kuhlî* Boie; and applied by American writers to *P. major* Fab. By Bonaparte identified with his *Adamastor typus* (= *hæsitata* Forst. Gould, Reich. nec Kuhl, Temm. = *Adamastor cinereus* of my paper,) in which opinion I entirely concur. According to Mr. Gray, the genus *Priofinus* Homb. et Jacq. is based upon this same bird, and antedates *Adamastor* of Bonaparte. The proper name of the species in question would then be *Priofinus cinereus*.

18. *Proc. gigantea*, p. 563, = *Ossifraga gigantea* Reich.

19. *Proc. brasiliانا* p. 564. Very dubious. May be the same as the preceding species; or the *Graculus brasilianus*, as identified by Bonaparte.

4. *Proc. æquinoctialis*, p. 564, and var. B., = *Majaqueus æquinoctialis* Reich.

20. *Proc. grisea*, p. 564. Unidentifiable.

21. *Proc. gelida*, p. 564. I think that this name was based upon the species subsequently named *flavivestris* by Mr. Gould, the proper name of which appears to be *Priofinus gelidus*.

22. *Proc. alba*, p. 565. Evidently a species of *Æstelata*, and probably some one of the plumages of *Æ. Lessoni*.

#### LATHAM, *Index Ornithologicus*, ii. (1790.)

Of Dr. Latham's three principal works this is the one usually referred to, as being the only one in which Latin binomial names are used. Most of the species given in this work have exactly the same import as those of Gmelin, and need not therefore be noticed. The following are the chief points requiring attention:—

6. *Proc. alba*, var. B., p. 822.—“Norfolk Island Petrel.” A species subsequently named *Proc. Phillippi* by Gray, with which *P. mollis* Gould is considered as probably synonymous.

18. *Proc. marina*, p. 826.—First definite characterization of the type of the genus *Pelagodroma* (*Pel. fregata* Bp. *Pel. marina*, Reich.)

21. *Proc. Forsteri*, p. 827, = *Proc. vittata* Gm.

23. *Proc. pacifica* p. 827. Same as that of Gmelin. The name is unidentifiable, unless we regard it as expressive of a valid species. By Mr. Gray it is so considered (Cat. Birds Pac. Isl.) and the following cited as synonymous: *Nectris fuliginosus* (Sol.) Banks, ic. 23.—*Proc. fuliginosa* Kuhl, sp. 27; (but not Kuhl's sp. 12!) *Puff. pacificus* Gray, Gen. Birds, p. 647. It is a large *Puffinus*, 22 inches long, with flesh-colored bill and feet; from Euopoa.

24. *Proc. obscura*, p. 828, = that of Gmelin. By Mr. Gray this name is considered the same as that of Vieillot, (Nouv. Dict. xxv. p. 423, and Gal. Ois. tab. 301;) and is made to include the Australian form (figured by Mr. Gould, pl. 59 of the B. Aust. and named by him *assimilis*;) which is considered distinct by the majority of writers.

#### VIEILLOT, *Nouv. Dict. d'Hist. Nat.* xxv. (1817.)

The article “Petrel” of this work is in general a close copy of Gmelin and Latham. Certain points, however, may be noticed.

*Proc. pelagica*, p. 416. Mentions under this head the “Petrel échasse” of Temminck.

*Proc. grallaria*, Vieill. p. 418. First name of the species subsequently named *leucogaster* by Gould; unless as is possibly the case *fregata* of Linnæus be this species rather than the *Pelagodroma marina*.

*Proc. fuliginosa*, p. 418. Latham's Otaheite species, whatever that may be.

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- Proc. grisea*, p. 419. Unidentified. = that of Gm. and Lath.  
*Proc. alba*, p. 419. Mentions under this head the "Norfolk Island Petrel," subsequently named *P. Phillippii* by G. R. Gray.  
*Proc. puffinus*, p. 421, = *Puff. anglorum*. Cites Pl. Enl. 962. The "*Proc. puffinus* var. Lath. Pl. Enl. No. 39" may refer to *Puffinus Kuhlî* Boie.  
*Proc. pacifica*, p. 422. "Se trouve en Europe" by error for "Euopoa."  
*Proc. æquinoctialis*, p. 422. Refers as a variety of this species to the "Kurile Petrel" of Latham and Pennant, from Kamtschatka; a bird now generally supposed to be some species of *Nectris*; which latter identification requires confirmation.  
*Proc. leucorhoa*, Vieill. p. 422. First designation of the *Thalassidroma Leachii* Temm.  
*Proc. obscura*, p. 423. Is this the same as Gmelin's species? This reference to Vieillot should rather be cited for the name of the common small Atlantic *Puffinus*.

HEINRICH KUHLE, *Beit. Zool. u. Vergl. Anat.* (1820.)

In this work there is presented a "Beiträge zur Kenntniss der Procellariiden" which is a very important contribution to the bibliography of the family, marking perhaps the first decided advance over the writers of the eighteenth century. The following species are given in this monograph:

1. *Proc. furcata* "L." p. 136. = *Oceanodroma furcata* Reich.
2. *Proc. oceanica* "Banks," p. 136. = *Thalassidroma Wilsoni* (*P. pelagica* Wils.) of most ornithologists, now *Oceanites oceanica* mihi.
3. *Proc. marina* "Lath." p. 137. = *Pelagodroma fregata* Bp. and of my paper; *Pelag. marina* Reich.
4. *Proc. Leachii* "Temm." p. 137. = *P. leucorrhoa* Vieill. = *Cymochorea leucorrhoa* Coues.
5. *Proc. fregata* "Banks," p. 138. = *P. grallaria* Vieill. nec Licht, (= *leucogaster* Gould.)
6. *Proc. pelagina*, p. 139. = *P. pelagica* Linn.
7. *Proc. glacialis*, p. 139. = *Fulmarus glacialis* Leach.
8. *Proc. capensis*, p. 140. = *Daption capensis* Steph.
9. *Proc. gigantea*, p. 140. = *Ossifraga gigantea* Reich.
10. *Proc. æquinoctialis*, p. 141. = *Majaqueus æquinoctialis* Reich.
11. *Proc. hasitata* "Forst." p. 142. But not of Forster. Kuhl's *hasitata* is the same as that of Temminck, Pl. Col. 416, which is an *Æstrelata*. (*Æst. diabolica* Bp. = *Æst. hæsitata* of my paper.)
12. *Proc. fuliginosa*, p. 142. = *fuliginosa* Forst. nec auct. = *Proc. atlantica* Gould. = *Pterodroma atlantica* Bp. = *Æstrelata fuliginosa* Mihi.
13. *Proc. desolata*, p. 143. = *Æstrelata desolata* Bp.
14. *Proc. turtur*, "Banks," p. 143.—I prefer Mr. Gould's identification of this species to that of Dr. Schlegel. See remarks in my paper on *Prionæ*.
15. *Proc. grisea* "L." (Gm.) p. 144.—Not of Gm. Lath. Examine Dr. Schlegel's identification of this species; which I follow.
16. *Proc. cærulea* "Forst." p. 145. The *cærulea* of Gmelin, which Forster calls "*similis*."
17. *Proc. urinatrix* "Forst." p. 145. The *urinatrix* of Gm. now *Pelecanoides urinatrix*, which Forster calls *Proc. tridactyla*.
18. *Proc. nivea*, p. 145. = *Pagodroma nivea* Bp.
19. *Proc. antarctica* p. 145. = *Thalassoica antarctica*.
20. *Proc. lugens* "Forst." p. 145. Not positively identifiable. Dr. Kuhl<sup>1</sup> 1866.]

says that he "thinks it is *P. grisea* L." which, according to his use of this name, would make it the species described in my paper upon Dr. Schlegel's authority as *Æstrelata grisea*.

21. *Proc.* ——— "Forst. tab. 20," p. 145. An undetermined species.
22. *Proc. puffinus*, p. 146. = *Puffinus major* Fab.
23. *Proc. anglorum*, p. 146. = *Puffinus anglorum* Temm.
24. *Proc. obscurus*, p. 147. = Vieillot's species.
25. *Proc. cinerea*, "L." p. 148. Not of Linnæus or Gmelin; but the *Puffinus Kuhlîi* Boie.
26. *Proc. munda* "Banks, tab. 24," p. 148. = Quid?
27. *Proc. fuliginosa* "Banks tab. 23," p. 148. Quite a different bird from Kuhl's sp. 12. Unidentifiable by the description. By G. R. Gray identified with *Proc. pacifica* Lath., whatever that species may be!
28. *Proc. vittata* p. 149. = *Prion vittatus* Lacép.

STEPHENS, *Continuation of Shaw's General Zoology*, xlii. (1825.)

This work closely adheres to Gmelin's and Latham's authority. A few points may profitably be examined.

*Proc. oceanica*, p. 223. Not the *Oceanites oceanica* (*Thalassidroma Wilsoni*) but a species of *Fregetta*, probably *F. grallaria*. Author refers to Forster; to Pl. Enl. 993; to Temm. Man. p. 520; and to Bp. Journ. Acad. Phila. v. iii. p. 8. On the following page (p. 224) "*Proc. Wilsoni*" is presented.

*Puff. cinereus*, p. 227. The synonyms adduced are chiefly those of *Adamastor cinereus*; description applies either to this latter or to *Puffinus Kuhlîi* Boie; the description of the young would do for *Puffinus major* Fab.

*Puff. æquinoctialis*, p. 229. Cites *Proc. pacifica* Lath. as a queried synonym. *Puff. obscurus*, p. 230, is Gmelin's species.

Genus *Fulmarus* instituted, p. 233.

*Fulmarus antarcticus*, Steph. p. 236, is based upon *Proc. glacialis* var. B. Lath. Ind. Orn. ii. p. 823, (= Var. A. sp. 9, p. 405, of Lath. Gen. Syn.) which is the *Thalassoica glacialis*. This synonym of the species was accidentally omitted in my paper on the *Fulmaræ*, and the omission not discovered until too late.

Genus *Daption* instituted, p. 239, with *capensis* as type. The author "ventures to attach the numerous Southern Petrels described by Latham thereto," producing a heterogeneous assemblage in which figure *antarctica*, *nivea*, *desolata*, *gelida*, *grisea*, (of Linn. nec Kuhl, Schl.) *alba*, and *fuliginosa* (= Latham's Otaheit species.)

Genus *Pachyptila* "Ill." adopted; under it are arranged, besides its type *vittata* (here called "*Forsteri*") *cærulea* Gm., *marina* Lath., *fregata* Linn. and *fureata* Gm., nearly all of which are typical of distinct genera.

JOAN. REIN. FORSTER, *Descr. Anim. etc. curante HENR. LICHTENSTEIN*. (1844.)

The numerous species described and named by Forster have an important bearing upon the bibliography of the Family. It is greatly to be regretted that they were only published at a comparatively recent date: and that his figures still remain inedited. Forster appears to have had very little regard for priority in the matter of names; but his descriptions are in the main so excellent, that nearly all his species are identifiable. The following is a list of the species given by him:

*Proc. capensis*, p. 20.

*Proc. vittata*, p. 21.

*Proc. fuliginosa*, p. 23. = *Proc. atlantica* Gould. = *Pterodroma atlantica* Bp. = *Æstrelata fuliginosa* of my paper. Not of Gm. Lath. Vieill. Not of Strickland. Equals Kuhl's sp. 12; but not his sp. 27.

[May,

- Proc. puffinus*, p. 23. Not of Linn. Gm. Lath. Some large Southern *Puffinus* possibly the true *P. major*, Fab.
- Proc. glaucalis*, p. 25. Not of L. Gm. Lath.; but the *Thalassoica glacialis* (Smith) Reich.
- Proc. nigra*, p. 26, = *æquinoctialis* L.
- Proc. nivea*, p. 58.
- Proc. similis*, p. 59. = *Halobæna cærulea*, Bp. ex Gm.
- Proc. antarctica*, pp. 60 and 202.
- Proc. gavia*, p. 148. Not subsequently identified with any known species. By Gray regarded as a valid species; and so given in these papers.
- Proc. tridactyla*, p. 149. = *Pelecanoides urinatrix* Lacép. ex Gm.
- Proc. fregata*, p. 180. The *grallaria* of Lichtenstein; not of Vieillot. Probably the species subsequently named *melanogaster* by Gould.
- Proc. inexpectata*, p. 204. A somewhat doubtful species, coming nearest to *mollis* Gould, with which I have identified it.
- Proc. tristis*, p. 205. ("Pr. fuliginosa, rostro fusco, pedibus anticæ glaucis;  $17\frac{1}{2} \times 38$ ; bill 2; its width  $\frac{1}{2}$ ; its depth  $\frac{3}{8}$ ." ) A southern fuliginous *Puffinus*, not identified with any known species. Mr. G. R. Gray (Ibis, 1862, p. 244) considers it as a valid species, and assigns the following synonymy: *Proc. grisea* Forst. ic. ined. 94; (nec Gm.) *Puff. major*, Gray, Ereb. and Terr. (nec Fab.) *P. fuliginosus* Homb. and Jacq. Voy. Pôle. Sud. tab. 32, fig. 7. (nec Strickl.) *Puf. cinereus* A. Smith, Ill. S. Afr. Bds. (nec Gm. nec Auct.) *Nectris gama*, Bonap.
- Proc. leucocephala*, p. 206. = *Proc. Lessonii* Garn. (*Æstrelata Lessoni* Cass.)
- Proc. hæsitata*, p. 208. = *P. cinereus*, Gm. Lath. Vieill. Lawr. = *Adamastor typus* Bp. = *Adam. ciner.* or *Prifinus ciner.* Coues. = *Proc. Adamastor* Schlegel, etc. etc. The *hæsitata* of Gould and Reichenbach, but not of Kuhl and Temminck, which is an *Æstrelata*.
- Proc. ossifraga*, p. 343. = *gigantea* Gm.

In bringing to a close the present series of papers, the author is deeply sensible of their many defects; and can only crave for them a lenient judgment in view of the very difficult nature of the task he attempted, and has throughout conducted, with the sole desire of elucidating truth. Should the undertaking prove a failure, and the meagre results incommensurate with the time and labor bestowed,—at least it may be said of him, "— si non tenuit, magnis tamen excidit ausis."

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**Observations upon the Cranial Forms of the American Aborigines, based upon Specimens contained in the Collection of the Academy of Natural Sciences of Philadelphia.**

BY J. AITKEN MEIGS, M. D.

The early record of every science abounds in crude facts, imperfect observations, and, consequently, in generalizations so hastily formed as to partake more of the character of mere speculation than of strictly logical deduction. These erroneous statements and premature generalizations are at first generally accepted as scientific truths. A few cautious observers, it is true, may withhold from them their assent, but their opinions find no support beyond themselves, until these facts and hypotheses come in conflict with others better known and better established, or, are employed in developing still higher and more comprehensive theories. Then, for the first time, they are subjected to a rigid investigation, and their true value, at length, ascertained. Nowhere can we find a more instructive example of this assertion than in the doctrine which ascribes to the American aborigines a homogeneous cranial type. For the philosophical ethnologist this doctrine is full of interest. If the 1866.]